

CLAIMS

What is claimed is:

1. An electrochromic optical attenuator, comprising:

at least one polarizing element having an optical polarization axis, wherein the polarizing element transmits a portion of a light signal proportional to the angular difference between the optical polarization axis of the light signal and that of the polarizing element; and

a variable electrochromic optical attenuator comprising:

a semi-transparent electrochromic device; and

a plurality of electrodes configured to conduct electricity to the electrochromic device such that the transparency of the electrochromic device will be affected by an amount proportional to the magnitude of the electricity applied to the plurality of electrodes;

wherein the intensity of the light signal transmitted through the electrochromic device is affected by an amount proportional to the magnitude of the electricity applied to the plurality of electrodes.

2. The optical attenuator of claim 1, wherein the polarizing element comprises a polarizer having a linear optical polarity.

3. A laser package comprising:
 - a laser configured to generate a light signal having an optical polarization axis;
 - a variable electrochromic optical attenuator comprising:
 - a semi-transparent electrochromic device; and
 - a plurality of electrodes configured to conduct electricity to the electrochromic device such that the transparency of the electrochromic device will be affected by an amount proportional to the magnitude of the electricity applied to the plurality of electrodes, wherein the intensity of the light signal transmitted through the semi-transparent electrochromic device will also be affected by an amount proportional to the magnitude of the electricity applied to the plurality of electrodes; and
 - at least one polarizing element having an optical polarization axis, wherein the polarizing element transmits a portion of the light signal proportional to the angular difference between the optical polarization axis of the light signal and that of the polarizing element.

4. The laser package of claim 3, wherein the laser comprises a semiconductor laser or a gas laser.

5. The laser package of claim 3, wherein the laser comprises a distributed feedback laser.

6. The laser package of claim 3, wherein the polarizing element comprises a polarizer having a linear optical polarity.

7. The laser package of claim 3, further comprising a window or lens interposed between the laser and the variable electrochromic optical attenuator.

8. An optical transceiver package comprising the laser package of claim 3.

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9. A laser package for optical attenuation and isolation, comprising:
 - a laser configured to generate a light signal having an optical polarization axis;
 - a variable electrochromic optical attenuator comprising:
 - a semi-transparent electrochromic device; and
 - a plurality of electrodes configured to conduct electricity to the electrochromic device such that the transparency of the electrochromic device will be affected by an amount proportional to the magnitude of the electricity applied to the plurality of electrodes, wherein the intensity of the light signal transmitted through the semi-transparent electrochromic device will also be affected by an amount proportional to the magnitude of the electricity applied to the plurality of electrodes;
 - a first polarizing element in optical communication with the electrochromic optical attenuator and having an optical polarization axis, wherein the first polarizing element transmits a portion of the light signal proportional to the angular difference between the optical polarization axis of the light signal and that of the first polarizing element;
 - a faraday rotator in optical communication with the first polarizing element and comprising:
 - a semi-transparent material; and
 - a magnetic material at least partially surrounding the semi-transparent material and configured to apply a magnetic force to a light signal that is passed through the semi-transparent material; and

a second polarizing element in optical communication with the faraday rotator and having an optical polarization axis, wherein the second polarizing element transmits a portion of an incident light signal proportional to the angular difference between an optical polarization axis of the incident light signal and that of the second polarizing element.

10. The laser package of claim 9, wherein the laser comprises a semiconductor laser or a gas laser.

11. The laser package of claim 9, wherein the laser comprises a distributed feedback laser.

12. The laser package of claim 9, wherein the polarizing elements each comprise a polarizer having a linear optical polarity.

13. The laser package of claim 9, wherein the semi-transparent material comprises garnet.

14. The laser package of claim 9, wherein the magnetic material of the faraday rotator comprises a permanent magnet or a premagnetized hard ferromagnetic material.

15. The laser package of claim 9, further comprising a window or lens interposed between the laser and the variable electrochromic optical attenuator.

16. An optical transceiver package comprising the laser package of claim 9.

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17. A method of attenuating and isolating a light signal, comprising:
- directing a light signal from a laser to a variable electrochromic optical attenuator, the electrochromic optical attenuator comprising:
 - a semi-transparent electrochromic device; and
 - a plurality of electrodes configured to conduct electricity to the electrochromic device such that the transparency of the electrochromic device will be affected by an amount proportional to the magnitude of the electricity applied to the plurality of electrodes;
 - transmitting at least a portion of the light signal through the electrochromic device, wherein the intensity of the light signal transmitted through the electrochromic device is affected by an amount proportional to the magnitude of the electricity applied to the plurality of electrodes;
 - directing the light signal from the electrochromic device to a first polarizing element;
 - directing the light signal from the first polarizing element to a faraday rotator, the faraday rotator comprising:
 - a semi-transparent material; and
 - a magnetic material at least partially surrounding the semi-transparent material; and
 - directing the light signal from the faraday rotator to a second polarizing element.

18. The method of claim 17, wherein the laser comprises a semiconductor laser or a gas laser.

19. The method of claim 17, wherein the laser comprises a distributed feedback laser.

20. The method of claim 17, wherein the polarizing elements each comprise a polarizer having a linear optical polarity.

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